

We claim:

1. A mixing head assembly comprising:
 - a housing having an input mix chamber passageway and an output passageway, the input mix chamber passageway communicating with the output passageway;
 - a first input for injecting a first fluid into the input mix chamber passageway, the first input including a first nozzle configured to inject the first fluid into the input mix chamber passageway; and
 - a second input for injecting a second fluid into the input mix chamber passageway whereby the second fluid can mix with the first fluid to form a mixed fluid;
 - wherein the input mix chamber passageway is non-perpendicular to the output passageway.
2. The mixing head assembly of claim 1, wherein:
 - the second input includes a second nozzle configured to inject the second fluid into the input mix chamber passageway.
3. The mixing head assembly of claim 2, wherein:
 - the first nozzle is configured to inject the first fluid into the input mix chamber passageway along a first axial line;
 - the second nozzle is configured to inject the second fluid into the input mix chamber passageway along a second axial line; and
 - the first axial line and the second axial line are not co-linear.
4. The mixing head assembly of claim 3, wherein:
 - the first axial line and the second axial line are not co-planar.
5. The mixing head assembly of claim 4, wherein:
 - the first nozzle and the second nozzle are configured to inject the first fluid and the second fluid into the input mix chamber passageway such that the first fluid and the second fluid meet at an intersection point; and

the intersection point is not located along a longitudinal axis of the input mix chamber passageway.

6. The mixing head assembly of claim 3, wherein:
the first axial line is above a centerline of the input mix chamber passageway; and
the second axial line is below the centerline of the input mix chamber passageway.
7. The mixing head assembly of claim 1, wherein:
the input mix chamber passageway includes an input annular cross section with an input axis; and
the outlet passageway includes an outlet annular cross section with an outlet axis.
8. The mixing head assembly of claim 7, wherein:
an angle between the input axis and the outlet axis is from about 89° to about 80°.
9. The mixing head assembly of claim 8, wherein:
the angle between the input axis and the outlet axis is about 88°.
10. The mixing head assembly of claim 1, further including:
a cleanout piston rod located in the outlet passageway configured to slide within the outlet passageway to push the mixed fluid in the outlet passageway out of the outlet passageway.
11. The mixing head assembly of claim 1, further including:
a mixing chamber piston rod located in the input mix chamber passageway configured to slide within the input mix chamber passageway to push the mixed fluid in the input mix chamber passageway out of the input mix chamber passageway and into the outlet passageway.
12. The mixing head assembly of claim 1, wherein
the housing includes a discharge outlet at an end of the outlet passageway;
the input mix chamber passageway meets the outlet passageway at a meeting area;

the first fluid mixes with the second fluid at a mixing area; and
an angle between the input mix chamber passageway and the outlet passageway defined by the discharge outlet, the meeting area and the mixing area is acute.

13. The mixing head assembly of claim 12, wherein:

the angle between the input mix chamber passageway and the outlet passageway is from about 89° to about 80°.

14. The mixing head assembly of claim 13, wherein:

the angle between the input mix chamber passageway and the outlet passageway is about 88°.

15. A mixing head assembly comprising:

a housing having an input mix chamber passageway and an output passageway, the input mix chamber passageway communicating with the output passageway;

a first nozzle for injecting a first fluid into the input mix chamber passageway; and

a second nozzle for injecting a second fluid into the input mix chamber passageway

whereby the second fluid can mix with the first fluid to form a mixed fluid;

the first nozzle being configured to inject the first fluid into the input mix chamber passageway along a first axial line;

the second nozzle being configured to inject the second fluid into the input mix chamber passageway along a second axial line;

wherein the first nozzle and the second nozzle are configured to inject the first fluid and the second fluid into the input mix chamber passageway such that the first fluid and the second fluid meet at an intersection point; and

wherein the first axial line and the second axial line are not co-linear;

wherein the first axial line and the second axial line are not co-planar; and

wherein the intersection point is not located along a longitudinal axis of the input mix chamber passageway.

16. The mixing head assembly of claim 15, wherein:
the input mix chamber passageway is non-perpendicular to the output passageway.
17. The mixing head assembly of claim 16, wherein:
the input mix chamber passageway includes an input annular cross section with an input axis; and
the outlet passageway includes an outlet annular cross section with an outlet axis.
18. The mixing head assembly of claim 17, wherein:
an angle between the input axis and the outlet axis is from about 89° to about 80° .
19. The mixing head assembly of claim 18, wherein:
the angle between the input axis and the outlet axis is about 88° .
20. The mixing head assembly of claim 15, further including:
a cleanout piston rod located in the outlet passageway configured to slide within the outlet passageway to push the mixed fluid in the outlet passageway out of the outlet passageway.
21. The mixing head assembly of claim 15, further including:
a mixing chamber piston rod located in the input mix chamber passageway configured to slide within the input mix chamber passageway to push the mixed fluid in the input mix chamber passageway out of the input mix chamber passageway and into the outlet passageway.
22. The mixing head assembly of claim 15, wherein:
the housing includes a discharge outlet at an end of the outlet passageway;
the input mix chamber passageway meets the outlet passageway at a meeting area;
the first fluid mixes with the second fluid at a mixing area; and
an angle between the input mix chamber passageway and the outlet passageway defined by the discharge outlet, the meeting area and the mixing area is acute.

23. The mixing head assembly of claim 22, wherein:
the angle between the input mix chamber passageway and the outlet passageway is from about 89° to about 80°.
24. The mixing head assembly of claim 23, wherein:
the angle between the input mix chamber passageway and the outlet passageway is about 88°.
25. A method of mixing a first fluid and a second fluid in a mixing head assembly comprising:
providing the mixing head assembly with a housing having an input mix chamber passageway and an output passageway, the input mix chamber passageway communicating with the output passageway;
angling the input mix chamber passageway relative to the output passageway at a non-perpendicular angle;
injecting the first fluid into the input mix chamber passageway through a first nozzle of a first input;
injecting the second fluid into the input mix chamber passageway; and
mixing the first fluid with the second fluid to form a mixed fluid.
26. The method of mixing of claim 25, wherein:
injecting the second fluid includes injecting the second input through a second nozzle.
27. The method of mixing of claim 26, wherein:
injecting the first fluid comprises injecting the first fluid into the input mix chamber passageway along a first axial line; and
injecting the second nozzle comprises injecting the second fluid into the input mix chamber passageway along a second axial line; and
further including positioning the first axial line and the second axial line along lines that are not co-linear.

28. The method of mixing of claim 27, further including:
positioning the first axial line and the second axial line along lines that are not coplanar.
29. The method of mixing of claim 28, wherein:
the first fluid and the second fluid meet at an intersection point; and
further including positioning the intersection point at a position spaced from a longitudinal axis of the input mix chamber passageway.
30. The method of mixing of claim 27, further including:
positioning the first axial line above a centerline of the input mix chamber passageway;
and
positioning the second axial line below the centerline of the input mix chamber passageway.
31. The method of mixing of claim 26, wherein:
the input mix chamber passageway includes an input annular cross section with an input axis; and
the outlet passageway includes an outlet annular cross section with an outlet axis.
32. The method of mixing of claim 31, wherein:
angling the input mix chamber passageway relative to the output passageway at a non-perpendicular angle includes angling the input axis and the outlet axis at the non-perpendicular angle, the non-perpendicular angle being from about 89° to about 80° .
33. The method of mixing of claim 32, wherein:
the non-perpendicular angle is about 88° .
34. The method of mixing of claim 26, further including:
providing the housing with a cleanout piston rod located in the outlet passageway; and
sliding the cleanout piston rod within the outlet passageway.

35. The method of mixing of claim 34, further including:
pushing the mixed fluid in the outlet passageway out of the outlet passageway.
36. The method of mixing of claim 26, further including:
providing the housing with a mixing chamber piston rod located in the input mix chamber passageway; and
sliding the mixing chamber piston rod within the input mix chamber passageway.
37. The method of mixing of claim 36, further including:
pushing the mixed fluid in the input mix chamber passageway out of the input mix chamber passageway and into the outlet passageway.
38. The method of mixing of claim 26, wherein:
the housing includes an discharge outlet at an end of the outlet passageway;
the input mix chamber passageway meets the outlet passageway at a meeting area;
the first fluid mixes with the second fluid at a mixing area; and
angling the input mix chamber passageway relative to the output passageway at the non-perpendicular angle comprises angling the input mix chamber passageway relative to the outlet passageway such that an exchange angle between the input mix chamber passageway and the outlet passageway defined by the discharge outlet, the meeting area and the mixing area is acute.
39. The method of mixing of claim 38, wherein:
the exchange angle is from about 89° to about 80° .
40. The method of mixing of claim 39, wherein:
the exchange angle is about 88° .
41. The method of mixing of claim 26, wherein:
the first fluid is polyol and the second fluid is isocyanate.

42. A method of mixing a first fluid and a second fluid in a mixing head assembly comprising:

providing the mixing head assembly with a housing having an input mix chamber passageway and an output passageway, the input mix chamber passageway communicating with the output passageway;

injecting the first fluid along a first axial line into the input mix chamber passageway through a first nozzle;

injecting the second fluid along a second axial line into the input mix chamber passageway through a second nozzle;

mixing the first fluid with the second fluid to form a mixed fluid at an intersection point;

positioning the first axial line and the second axial line along lines that are not co-linear;

positioning the first axial line and the second axial line along lines that are not coplanar; and

positioning the intersection point at a position spaced from a longitudinal axis of the input mix chamber passageway.

43. The method of mixing of claim 42, further including:

angling the input mix chamber passageway relative to the output passageway at a non-perpendicular angle.

44. The method of mixing of claim 43, wherein:

the input mix chamber passageway includes an input annular cross section with an input axis; and

the outlet passageway includes an outlet annular cross section with an outlet axis.

45. The method of mixing of claim 44, wherein:

angling the input mix chamber passageway relative to the output passageway at a non-perpendicular angle includes angling the input axis and the outlet axis at the non-perpendicular angle, the non-perpendicular angle being from about 89° to about 80° .

46. The method of mixing of claim 45, wherein:
the non-perpendicular angle is about 88° .
47. The method of mixing of claim 43, wherein:
the housing includes an discharge outlet at an end of the outlet passageway;
the input mix chamber passageway meets the outlet passageway at a meeting area;
the first fluid mixes with the second fluid at a mixing area; and
angling the input mix chamber passageway relative to the output passageway at the non-perpendicular angle comprises angling the input mix chamber passageway relative to the outlet passageway such that an exchange angle between the input mix chamber passageway and the outlet passageway defined by the discharge outlet, the meeting area and the mixing area is acute.
48. The method of mixing of claim 47, wherein:
the exchange angle is from about 89° to about 80° .
49. The method of mixing of claim 48, wherein:
the exchange angle is about 88° .
50. The method of mixing of claim 42, further including:
providing the housing with a cleanout piston rod located in the outlet passageway; and
sliding the cleanout piston rod within the outlet passageway.
51. The method of mixing of claim 50, further including:
pushing the mixed fluid in the outlet passageway out of the outlet passageway.
52. The method of mixing of claim 42, further including:
providing the housing with a mixing chamber piston rod located in the input mix chamber passageway; and
sliding the mixing chamber piston rod within the input mix chamber passageway.

53. The method of mixing of claim 52, further including:
pushing the mixed fluid in the input mix chamber passageway out of the input mix chamber passageway and into the outlet passageway.
54. The method of mixing of claim 42, wherein:
the first fluid is polyol and the second fluid is isocyanate.
55. A mixing head assembly comprising:
a housing having an input mix chamber passageway and an output passageway, the input mix chamber passageway communicating with the output passageway;
a first nozzle for injecting a first fluid into the input mix chamber passageway, the first nozzle being configured to inject the first fluid into the input mix chamber passageway along a first axial line; and
a second nozzle for injecting a second fluid into the input mix chamber passageway whereby the second fluid can mix with the first fluid to form a mixed fluid, the second nozzle being configured to inject the second fluid into the input mix chamber passageway along a second axial line;
wherein the input mix chamber passageway is non-perpendicular to the output passageway;
wherein the first nozzle and the second nozzle are configured to inject the first fluid and the second fluid into the input mix chamber passageway such that the first fluid and the second fluid meet at an intersection point;
wherein the first axial line and the second axial line are not co-linear;
wherein the first axial line and the second axial line are not co-planar; and
wherein the intersection point is not located along a longitudinal axis of the input mix chamber passageway.
56. A method of mixing polyol and isocyanate in a mixing head assembly comprising:
providing the mixing head assembly with a housing having an input mix chamber passageway and an output passageway, the input mix chamber passageway communicating with the output passageway;

angling the input mix chamber passageway relative to the output passageway at a non-perpendicular angle;

injecting the polyol along a first axial line into the input mix chamber passageway through a first nozzle;

injecting the isocyanate along a second axial line into the input mix chamber passageway through a second nozzle;

mixing the polyol with the isocyanate to form polyurethane foam at an intersection point;

positioning the first axial line and the second axial line along lines that are not co-linear;

positioning the first axial line and the second axial line along lines that are not coplanar; and

positioning the intersection point at a position spaced from a longitudinal axis of the input mix chamber passageway.